

REMARKS

Claims 1-15 are pending in the application. Applicants thank the examiner for her indication of allowable subject matter in claim 11. Claims 1-10 and 12-15, however, stand newly rejected under 35 U.S.C. § 103 (a). Applicants respectfully traverse the rejections, and request that the rejections be reconsidered in view of the following remarks.

Rejections under 35 U.S.C. § 103(a)

Claims 1-10, and 12-15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over US 5,413,227 to Diebold et al. ("Diebold et al.") in view of DE 3407236 to Schmidt ("Schmidt").

Independent Claim 1

The presently claimed invention is directed to applicant's discovery that the mechanical pressing of feedstock between the rotatable surface and the ablative surface, combined with the movement of the feedstock along with the ablative surface, provides a surprisingly efficient thermolysis system. The prolonged pressing of the feedstock onto the ablative surface by the rotatable blades ensures an effective and surprisingly efficient transfer of heat from the ablative surface to the feedstock.

The examiner acknowledges that "Diebold et al. does not disclose at least one rotatable surface..., wherein the rotatable surface is positioned relative to the ablative surface such that the feedstock is mechanically pressed between a part of the rotatable surface and said ablative surface and moved along the ablative surface by the rotatable surface..." However, the examiner contends that the deficiencies of Diebold et al. are met by the Schmidt reference which is alleged to teach such a rotatable surface.

At the outset, applicant emphasizes that Schmidt's reactor is entirely different from Diebold et al.'s reactor. Diebold et al. et al. is directed to a fast pyrolysis reactor system using a vortex reactor in which the vortex axis is oriented in the **vertical** direction. Schmidt, on the other hand, discloses a rotary drum reactor, used for low bulk density feed material, which is slightly inclined from the **horizontal**.

Schmidt teaches the drum itself is rotated by a motor 15 and gearing arrangement 13, 14. Within the drum is held a roller 25 having screw fins 36. The roller is held at only one end

of the rotary drum by a chain 35 and a bearing 34. The form of the roller is such that at one end, it is tapered in shape to allow feed material to be introduced into the drum. The roller has a large mass to compress the feed material as it passes along the drum. The arrangement is such that the axis of the roller must always be inclined with respect to axis of rotation of the drum. The roller is held only at one end, and the roller gradually compresses the feed material as it passes along the drum. Thus, as shown in Fig. 3 of Schmidt, the axis of the roller is not parallel to the axis of rotation of the drum.

Contrary to the examiner's assertion, the teachings of Schmidt would not have led one of ordinary skill to modify Diebold et al. to have a rotatable surface having an axis of rotation coincident with the longitudinal axis of the cylinder, as recited in claim 1. Schmidt requires that the axis of the roller is not coincident with the axis of rotation of the drum, and that the roller compress the feed material only at the base portion of the drum. The roller of Schmidt does not compress the feed material around the periphery of the drum. Nothing in Schmidt would have led the skilled artisan to modify Diebold et al. to achieve the limitations of claims 1 in which the rotatable surface has an axis of rotation coincident with the axis of the cylindrical ablative surface.

As noted above, the skilled artisan would not even consider that the disclosure of Schmidt has relevance to the disclosure of Diebold et al. because Diebold et al. is in the field of vortex reactors and Schmidt is in the field of drum reactors. Even if it (for some unknown reason) one skilled in the art would have been prompted to modify the vortex reactor of Diebold et al. based on Schmidt's nonanalogous teachings, it is apparent that the result would be a vortex reactor having a rotary drum with a roller, the roller operating under gravity to compress the feed material at the base of the drum. This requires that the drum is close to a horizontal position. Schmidt requires that the axis of the roller is offset from the axis of rotation of the drum, in order to compress the feed material at the base of the drum. However, a key aspect of the Diebold et al. invention specifically requires that the reactor is vertically oriented. Thus, the invention described in Schmidt is inconsistent with the vertically oriented vortex reactor of Diebold et al. For at least this reason, the posited combination Diebold et al. and Schmidt would have been deemed infeasible, warranting the withdrawal of the subject rejection.

It is further noted that there is certainly nothing in Diebold et al. itself that would have prompted one of ordinary skill person to completely redesign the reactor to provide mechanical pressing of the feed material between the ablative surface and a rotatable surface, as recited in

claim 1, instead of relying on centrifugal effects. There is also nothing in Schmidt that would have prompted the skilled artisan to modify the reactor of Diebold et al. In fact, there is no reasonable basis on the present record for the examiner to assume that the reactor of Diebold et al. requires any modification.

Applicant respectfully submits that claim 1 defines ablative thermolysis reactors which are not rendered obvious by any combination of Diebold et al. and Schmidt.

Independent Claim 2

Independent claim 2 recites an ablative thermolysis reactor in which, among other things, the reaction vessel is bounded by an inner wall with the ablative surface being defined by an outwardly facing surface of the inner wall. The examiner acknowledges that Diebold et al. does not disclose such a limitation, but asserts that such a limitation is merely a matter of design choice. Applicant submits that this stated ground for rejection is not supportable. There is simply nothing in the present record that would have prompted one of ordinary skill to have made the modification posited to have been an obvious design choice.

Dependent Claim 3

The examiner recognizes that Diebold et al. does not disclose "a reactor wherein the...rotatable surface is mounted outwardly of the ablative surface and arranged to press feedstock toward the axis of rotation," as recited in claim 3. The examiner, however, asserts that Schmidt discloses such a reactor. In fact, as shown in Figure 3, Schmidt discloses a large mass roller to compress the feed material as it passes along the drum. Further, claim 3 is dependent on claim 2 which is deemed patentable as discussed above.

Dependent Claim 4

The examiner asserts that Diebold et al. inherently discloses "a reactor wherein the reaction vessel is bounded by an outer peripheral wall with the ablative surface being defined by an inwardly facing surface of said outer wall, since the reactor has an outer wall and the inner wall would be the ablative surface..." Nothing in the present record informs that the invention of Diebold et al. necessarily requires such a reaction vessel. Diebold et al. does not even hint at a rationale for having a reaction vessel so bounded.

Dependent Claim 5

The examiner acknowledges that Diebold et al. does not disclose "a reactor wherein the...rotatable surface is mounted inwardly of the ablative surface and arranged to press feedstock away from the axis of rotation. The examiner posits that the deficiency of Diebold et al. is met by Schmidt which is alleged to have such a rotatable surface. Claim 5 is indirectly dependent on claim 1 which applicants have shown is not rendered obvious by the combination of cited references.

Dependent Claim 6

The examiner asserts that Diebold et al. disclose a reactor wherein the ablative surface has a circular or elliptical cross-section perpendicular to the axis of rotation of the rotatable surface. Claim 6 is dependent on claim 1 and has all the limitations of claim 1, the combination of which is not rendered obvious by the combination of cited references.

Dependent Claim 7

The examiner recognizes that Diebold et al. does not disclose a reactor wherein the at least one rotatable surface is in the form of a rotatable blade. Nonetheless, the examiner asserts that the deficiency of Diebold et al. is met by Schmidt. Yet, there is no reasonable basis on the present record for the examiner to assume that Schmidt's roller acts in the same way as the rotatable blades as recited in claim 7.

Dependent Claim 8

The examiner asserts that Diebold et al. discloses a reactor wherein said heating means is adapted to heat said ablative surface to a temperature in the range of from about 400° C to about 700° C. Claim 8 is dependent on claim 1 and is not rendered obvious by the combination of cited references for at least the same reasons discussed above in relation to claim 1.

Dependent Claim 9

The examiner acknowledges that Diebold et al. does not disclose a reactor wherein said heating means is arranged to heat the ablative surface by electrical heating, by the combustion of a solid, liquid or gaseous fuel, by condensation or a vapour, or by circulation of a hot fluid. The examiner further states that Diebold et al. incorporate a reference that discloses a method

of supplying heat to the vortex reactor, and Schmidt discloses that the heating chambers are heated with hot flue gases from the combustion chamber. Claim 9 is dependent on claim 7 which recites a rotatable blade and indirectly depends from claim 1. For at least the reasons discussed above with respect to claims 7 and 1, claim 9 is not obvious over the combination of cited references.

Dependent Claim 10

The examiner acknowledges that Diebold et al. does not disclose a reactor wherein means are provided to adjust the angle of the rotatable surface, or front surface of each blade, when present, relative to the ablative surface. The examiner, however, asserts that Schmidt's nonanalogous teachings disclose a ball joint which adjusts the angle of rotation as the waste travels through the reactor. Claim 10 is dependent on claim 1 and for at least the same reasons discussed above in respect of claim 1, claim 10 is not rendered obvious by the combination of cited references.

Dependent Claim 12

The examiner acknowledges that Diebold et al. does not disclose a reactor wherein means are provided to adjust the spacing between each rotatable surface and the ablative surface. The examiner asserts that Schmidt discloses a ball joint which adjusts the angle of rotation as the waste travels through the reactor. For at least the same reasons discussed above in respect of claim 1, claim 12, which is dependent on claim 1 and includes all the limitations of claim 1, is not rendered obvious by the combination of cited references.

Dependent Claim 13

The examiner acknowledges that Diebold et al. does not disclose a reactor wherein the rotatable surface is resiliently biased toward the ablative surface. The examiner asserts that Schmidt discloses such a reactor. For at least the same reasons discussed above in respect of claim 1, claim 13, which is dependent on claim 1 and includes all the limitations of claim 1, is not rendered obvious by the combination of cited references.

Dependent Claim 14

The examiner acknowledges that neither Diebold et al. nor Schmidt discloses a reactor wherein a plurality of rotatable surfaces is provided, the rotatable surfaces preferably being

equi-angularly displaced about the axis of rotation. The examiner, however, asserts that Schmidt discloses a plurality of rotatable surfaces, and it is merely a matter of design choice to have rotatable surfaces which are equi-angularly displaced about the axis of rotation. Applicant submits that this stated ground for rejection is not supportable. There is simply nothing in the present record that would have prompted one of ordinary skill to have made the modification posited to have been an obvious design choice.

Dependent Claim 15

The examiner acknowledges that Diebold et al. does not disclose a reactor provided with a continuous feed mechanism for supplying feedstock into the reaction vessel. Apparently, the examiner also does not believe that Schmidt discloses any such mechanism. Yet, the examiner asserts that it is merely a matter of design choice to have a continuous feed mechanism for supplying feedstock into the reaction vessel. There is simply nothing in the present record that would have prompted one of ordinary skill to have made the modification posited to have been an obvious design choice. Applicant submits that this stated ground for rejection is not supportable.

CONCLUSION

In conclusion, no cited reference alone or in combination discloses the structure as recited in claims 1-15. In the absence of any identifiable reason that would have prompted a person of ordinary skill to combine elements found in the references in the way recited in the claims, the factual predicate necessary to establish *prima facie* obviousness has not been established.

In view of the foregoing, applicant respectfully requests reconsideration and withdrawal of the outstanding obviousness rejection. A notice of allowance is earnestly solicited. Should Examiner Young feel that any other point requires consideration or that the form of the claims can be improved, she is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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